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(54) FLUIDIZED BED REACTOR
WIRBELSCHICHTREAKTOR
REACTEUR A LIT FLUIDISE

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(73) Proprietor: **Foster Wheeler Energia Oy**
00440 Helsinki (FI)

(72) Inventors:
- **WIETZKE, Donald, L.**
  Carlsbad, CA 92009 (US)
- **RASKIN, Neil, R.**
  Carlsbad, CA 92009 (US)
- **DARLING, Scott**
  Annandale, NJ 08801 (US)

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Description

[0001] The present invention refers to a fluidized bed reactor having in its lower part a furnace section, delimited by side walls and a bottom grid, and supplying means, for introducing a gas, such as partial combustion air, into a bed of fluidized particles in the furnace section. Such supplying means include a gas source chamber, such as a windbox and at least one nozzle or conduit connected to one opening in a side wall, for introducing gas from said gas source chamber to the furnace section.

[0002] This invention is particularly applicable to large circulating fluidized bed (CFB) boilers having a thermal effect of, e.g., 200-400 MWe, or more, in which boilers the lower section of the boilar furnace and the bottom grid may be divided in two or more furnace sections, e. g. by a dual wall partition structure. The dual wall partition structure may be a complete partition wall raaching in the furnace from one wall to the opposite wall or a partial wall, i.e. the dual wall construction may consist of a continuous or a discontinuous wall batween two opposite furnace walls. In thesa large boilers partial air may be distributad through supplying means connected to the external sida walls and/or through supplying means connected to the partition wall structure. The partition wall structure, which typically is of a dual wall construction may be mada a refractory wall or a cooled wall connected to the cooling watar circulation of the boilar.

BACKGROUND OF THE INVENTION

[0003] Optimized emission control and maximum fuel burn-up are decisiva qualifications for a successful furnace design. Thus, they must especially be taken into considaration in circulating fluidized bed scale-up. A simple proportional scaling up of designs used in smaller systems may easily lead to problems in attempting to provide for a good mixing of fuel, combustion air and fluidized bed solids. Additionally, such designs may suffer from not being capable of providing a uniform furnace temperature within the optimum ranga and a sufficient heat transfer area. All thesa problems, which may causa enhanced emissions and lass than optimal fuel burn-up, have led to a desira to find altarnativa solutions. Such solutions have e.g. includad designs with multipla furnaces with a common back pass, providing heat transfer panels and/or partial or full division walls within the furnace, or dividing the lower part of tha furnace and the bottom grid with e.g. a dual wall structure.

[0004] Different solutions for sactioning the bottom area of a fluidized bed boiler furnace are known in the prior art. US patent 4,864,944 discloses a division of a fluidized bed reactor into compartments by partition walls having openings for secondary gas to be distributed in a desired manner into the reactor. The partition walls have ducts which are connected to air supply sources and lead to discharge openings at different heights in the partition walls. Correspondingly, US patent 4,817,563 discloses a fluidized bed system provided with ona or more displacement bodies, which may ba provided with lines and inlet openings for introducing secondary gas to segmentad sactions in the lower reactor.

[0005] US patant 5,370,084 discloses different configurations for effective mixing of fuel in a partitioned circulating fluidized bed boiler, including ducts which feed air into the boiler on the interior walls. US patant 5,215,042 and FR 2 681 668 disclose reactors divided into compartments by at least one vertical, substantially gas tight partition in the upper part of the combustion chamber. Tha partition wall comprises cooling tubes and is provided with at least one line with a distributing manifold to feed combustion air into the compartments.

[0006] US patent 4,545,959 disclosas a chamber for tha treatment of particulata matter in a fluidized bed, comprising a duct with triangular cross section on tha bottom of the chamber, and an arrangement of holes or slots in each of tha upwardly sloping sida walls of the duct for directing an ancillary gas from the duct into the chamber.

[0007] The above mentioned publications suggest introduction of gas into a reactor chamber, e.g. furnace chamber, through a partition wall within the chamber. A problem arises, however, as the ducting from tha air or gas source chamber to the air or gas injection point may be rather long and cause a high pressure drop. A problem arises also in these conventional supply duct constructions dua to solids back sifting, i.e. the problems with solid particles from the furnace tanding to flow into the gas supply ducts and increase tha pressure drop over the gas supply ducts. The increase in pressure drop may be very difficult to attand to or to take into considaration whan controlling the gas supply.

[0008] Conventional bottom grid nozzle constructions, e.g. thosa aquipped with bubble caps normally reaching upward from the bottom grid, would be exposed to heavy erosion if installed on a vertical partition wall within a fluidized bed, due to very high erosive forces caused by the downward flowing solid particle layers in the vicinity of the wall. In fluidized bed reactor furnaces solid particles tend to flow upward in the middle of each furnace section and downward along its vertical side walls. Such downward flowing particles come in the lower part of the furnace sections, when the cross sectional area of the furnace sections abruptly decreases, into intense turbulent motion which may locally laad to very strong erosive forces, e.g. also in the regions of secondary gas inlets. In the prior art no special solution for preventing backsifting into gas nozzles or conduits arranged on partition walls has been disclosed.

[0009] It is therefore an object of the present invention to provide a fluidized bed reactor with a furnace construction with an improvad gas supply configuration.

[0010] It is particularly an object of tha present invention to provide an improved gas supply configuration

suitable for large scale circulating fluidized bed (CFB) boilers.

[0011] It is then more specifically en object of the present invention to provide an improved secondary ges supply configuration arranged in a partition wall within the lower part of a boiler furnace.

[0012] it is more specifically an object of the present invention to provide a fluidized bed reactor with improved gas supply means, with minimized backsifting of solid particles into gas supply conduits therein.

[0013] it is thereby also an object of the present invention to provide a fluidized bed reactor with improved gas supply means with decreased pressure losses in the ges supply means.

SUMMARY OF THE INVENTION

[0014] These objects of the present invention are achieved in e fluidized bed reactor as defined in enclosed cleims. There is erranged in the reactor in the iower part of e furnace section therein, which furnace section is delimited by side walls end a bottom grid, a supplying means including

- a ges source chamber, such as a windbox,
- et ieast one opening in et least one of seid side walls at a level above the bottom grid, and
- at leest one conduit, connected by its one end to said at least one opening end by its other end to said gas source chamber, for introducing gas from said gas source chamber to said furnace section,

whereby, said at least one conduit comprises a solid flow seal, preventing solid particles from flowing backward from said furnace section into said at least one conduit in a manner preventing or noticeably decreasing said introduction of ges from said gas source chember to said furnece section.

[0015] in large scale fluidized bed reactors, divided by dual-wall partitions into separete furnace sections, at least a part of the free internal spece between the partition walls may according to a preferred embodiment of the present invention constitute the gas source chamber or windbox, providing secondary or other gas to the furnece sections. The gas source chamber may on the other hand if desired according to another preferred embodiment of the present invention be formed at another iocation eiso, e.g. connected to an external side wall or to the bottom grid.

[0016] Secondary ges or other similar gas is typically introduced into furnace sections through a plurality of gas injecting openings formed in the side walls delimiting the furnace sections. The openings may be arranged in a single row at the same vertical level in each wall, or the openings mey if desired be errenged in some other configuration and at several different vertical levels in the wells. A conduit, such as a bent pipe construction, is according to the present invention disposed between each of the openings end a ges source chamber, for introducing gas from the gas source chamber through the openings into the furnece sections.

[0017] A solid flow seel is formed in the conduits so as to prevent solid particles from flowing beckward into the conduit in a menner preventing or noticeebly decreasing the introduction of ges from the gas source chember to the furnace sections. Some minor back end forth flow of soiid perticles within the conduits close to the openings may be tolerable. The solid flow seals may be formed in different ways, e.g. depending on the location of the ges source chamber.

[0018] in a fluidized bed reactor, in which the gas source chamber is formed in the space between two partition weils forming a partition on the bottom grid, secondery gas/air nozzles or conduits in the form of openended standpipes may be used. The standpipes have a first open end connected to an opening in one of the partition walls at a first vertical level l_1, e.g. at the secondary eir injection level, and a second open end opening into the gas source chamber at e second vertical ievel l_2 which is et a higher ievel than the first vertical ievel. This construction may be used when et least a portion of the gas source chamber reaches to a vertical level above the injection level of the gas, e.g. the injection level of secondery air. However, this construction does not feil under the scope of the present invention.

[0019] The standpipe preferably has a circuiar cross section, but other forms are possible, such as siot like cross sections. The vertical extent of the stendpipe, i.e. the difference $l_2 - l_1$, has to be big enough to generally prevent solid particles from backsifting therethrough from the furnece section to the gas source chamber.

[0020] The standpipe may be bent at its lower end, such that the lower end thereof mey be fastened more eesily to a vertical or oniy slightly inclined side wall construction. The standpipe may even have a short nearly horizontel lower portion in order to bring the standpipe out from the side wall construction. Preferably a minimum distance or clearance is provided between the side wall end the standpipe elong the entire length of the standpipe, i.e. also when the side wall is inclined and epproaches the standpipe et the upper end thereof. Another solution would be to make the stendpipe slightly incilned.

[0021] The standpipe is, however, preferably substantially upright, but may due to constructional reasons and as discussed above have a lowermost portion, forming a $< 90°$, typically about 45°, but always $\geq 30°$ angle with the horizontal plane. The rest of the standpipe, i.e. the upper portion of the standpipe, is mainly upright forming a $\geq 30°$ angle with the horizontal plane.

[0022] In a fluidized bed reactor having a gas source chamber at e substantially different location, e.g. partly or totaiiy above or below the grid level, another conduit or nozzle construction may be used in order to bring up gas from the gas source chamber to e.g. the secondary gas ievel. The conduit, which may be formed of a pipe

or other similar element, has according to the present invention the form of an upside down U-band. A first end of the conduit is connected to an opening at a first vertical level l_1 in one of the side walls and a second end of the conduit is connacted at a third vertical level l_3 to an opening in an enclosura dalimiting the gas source chamber. The conduit has batween its first and second ends an upward bent portion, having its highast point at a second vertical level l_2, which is at a highar level than the first l_1 and third l_3 vertical levals. The first level, i.e. the secondary air injection level, typically is at a higher level than the third level, which may ba a.g. at the bottom grid level or below or above the grid level.

[0023] The vertical extant of an upright standpipe or tha haight of tha first portion of a bent conduit, correlatas to the solid flow backsifting prevanting ability of the conduit. Tha height difference Δl between the first l_1 and second l_2 vertical lavals is directly related to the pressure required to move solid particles through the standpipe, a.g. the largar the $\Delta\ell$ tha longer the standpipe, and the lass solid particles are able to backsift through the conduit.

[0024] Typically, a vertical column $\Delta\ell$ of about 1.0 meters may ba needad for providing an afficiant solid flow saal against normal furnace pressure variations.

[0025] The constructions described above may be used, as discussed earlier, in fluidized bed reactors having the lower part of the furnace section divided by a dual-wall partition. Such a partition may if dasired reach from the bottom grid up to the roof of the furnace, dividing the entire furnace chamber in two separate sections. Such furnace dividing walls preferably include at laast one opening in their uppar part to allow horizontal mixing of the gases and fluidized particlas in the separate furnace sactions.

[0026] Tha partition walls dividing the lower part of the furnace or tha divisional walls dividing the antire furnace into two parts or sactions may praferably be constructed of finned tube panels, whare the flow direction of the cooling medium is upwards from a haadar on tha laval of or below the furnace bottom. The cooling tubes of a partition wall may extend substantially vertically up to tha roof of tha furnace thus forming a divisional wall within the furnace, the tubes providing additional cooling surface area within the furnace.

[0027] In many known fluidized bed reactor constructions tha interior of dual wall partitions contain various ducts for differant purposas, but the interior space formed batwean the partition walls has not been otherwise utilized. Whan using, according to the present invention, at least a part of the interior of the dual wall partition as a windbox for air or gas, which is to be distributed into the furnace above the primary air grid, space is correspondingly spared below the main furnace grid. Moreover, the required length of ducting between windbox and air/gas introduction point in the furnace is minimized, which leads to decreased pressure losses, i.e. lower cost, compared to conventional constructions. Tha present invention then provides, due to tha decreased pressure losses, a bettar air/gas distribution and hence more optimal reaction conditions within the furnace. Also by locating structures preventing back sifting of solid particles into tha interior of a dual wall partition, the structures ara protected from the erosive forces of moving solids in the vicinity of the partition.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The abova brief description, as well as further objects, features and advantages of the present invantion will be more fully appreciated by reference to the following detailed description of following embodiments taken in conjunction with the accompanying drawings in which

- FIG. 1 schematically shows a vertical cross section of a first examplary fluidized bed reactor according to the present invention;
- FIG. 2 schematically shows a vertical and partly axonometrical cross section of the lower part of the fluidized bed reactor shown in FIG. 1;
- FIG. 3 schamatically shows a vertical cross section of another fluidized bed reactor;
- FIG. 4 schamatically shows a vertical cross section of the lower part of the other fluidized bed reactor shown in FIG. 3, and
- FIG. 5 schematically shows an enlargement of a cross section of a standpipe connected to a side wall.

[0029] The arrangements shown in figures 3 to 5 do not fall under the scope of the claims.

DETAILED DESCRIPTION OF THE DRAWINGS

[0030] Referring now specifically to FIG. 1 and FIG. 2 of the drawings, the reference numaral 10 refers, in general, to the fluidizad bed reactor, having a furnace 12, the lower part of which is divided in two furnace sections 14 and 16 by a partition 18, having a dual wall construction. The partition 18 is in FIG. 2 shown as a discontinuous partition consisting of partial partitions 18' and 18" separated by an intarmediate frea portion 19 allowing solids and gas flow from ona furnace section 14, 16 to the other 16, 14. Tha discontinuous partition shown in FIG. 2 is one example of a solids and gas flow path between furnace sections 14, 16, other embodiments not shown in these axample drawings include ona or mora conduits through the partition wall; a partial partition dual wall construction; and others. A fluidized bad of solid particles 20 is maintained in tha furnace 12. The furnace has external sida walls 22 and 24, a roof 26 and a bottom grid 28. Fluidizing air or gas is introduced into the furnace sections 14 and 16 through grid parts 28' and 28" from windboxes 30 and 32.

[0031] The partition 18, i.e. the partial partitions 18'

and 18", dividing the lower part of the furnace 12, is of a dual wall construction, i.e. formed of two inclined partition walls, I.e. a first 34 and a second 36 partition wall. Thereby e pertition space 38, or an internal space of the partition, is delimited by the partition walls 34 and 36 and a bottom 40 covered by the partition. The bottom 40 is in FIG. 2 shown to be disposed slightly below the grid 28 level, but could be formed at the same level as the grid or even above the grid level. A free space is formed between the windboxes 30 and 32 which can be used for other purposes. The gas space 38 between the partition walls 34 end 36 is divided by a horizontal nozzle supporting partition 41 into an upper 38' and a lower 38" gas spece.

[0032] Nozzles or conduits 42 and 44 according to the invention are disposed in two rows in the partition space 38' on the nozzle supporting partition or plate 41. The conduits 42 and 44 ere mede of tubes or pipes formed as upside down U-bends, one leg being longer than the other. The first conduits 42 ere connected by their shorter legs 46, i.e. the first ends of the conduits, to openings 48 in the partition wall 34 at a first vertical level l_1. The shorter legs 46 reach within the partition space 38' upward from the openings 48 to a second vertical level l_2, I.e. the highest point of the U-bend. The first conduits 42 are further connected by their longer legs 50, i.e. the second ends of the conduits, at a third vertical level l_3 to openings 52 in the nozzle supporting partition 41, the openings opening into a windbox or gas source chamber formed in the gas space 38" between the bottom 40 and the nozzle support partition 41. Similarly the other bent conduits 44 are connected to openings, in partition wall 36 and nozzle supporting partition 41.

[0033] The height difference $\Delta l = l_2 - l_1$ between the first ends of conduits 42 or 44 end the highest points of the conduits, I.e. of the U-bends, which corresponds to the vertical extension of the shorter legs 46 of the conduits, provides a solid flow seel. The pressure provided by the leg of solids against the counterflowing ges stream within the conduit then prevents particles from flowing from the furnace sections 14 end 16 upward into the conduits in such a manner that a severe pressure drop affecting gas flow through the conduits would erise. The solid flow seal also prevents backsifting of solid perticles through the entire conduits 42, 44 from the furnece to the windbox 38".

[0034] Thereby in the FIG. 1 end 2 embodiment openings 48, conduits 42, 44, including first legs 46 and second legs 50, as well as, a windbox 38" constitute e.g. a secondary gas supplying means for the fluidized bed reactor.

[0035] FIG. 3, 4 and 5 reter to another fluidized bed reactor which does not fall under the scope of the claims. Same reference numerals es in FIGS. 1 and 2 have been used where applicable. In this reactor a partition 18 reaches from the bottom grid 28 to the roof 26 dividing the entire furnace into two sections 14 and 16. A discontinuous partition, as indicated by reference numeral 19 in FIG. 2, or other similar solids and gas communication conduit between the furnace sections 14 and 16 mey also be provided. The lowermost portion of the partition 18 comprises two pertition walls 34, 36, forming a pyramidal free space 39 between the partition walls. The space 39 between partition walls 34 and 36 and a bottom plate 56 is used es e windbox or gas source chamber for the ges supplying meens. The gas source chamber may be divided by e horizontel partition 54, es shown in FIG. 4, into an upper 39' end e lower 39" windbox.

[0036] The bottom plate 56 is disposed at the bottom grid level 28, but could be disposed ebove or below said level. A free space 58 is due to this construction formed below the grid level between the fluidizing air windboxes 30, 32, which space mey be used for locating encillery elements which otherwise would heve to be located on the periphery of the reector. The reactor's total footprint area may thus be used more efficiently.

[0037] In this reactor the gas injecting conduits 60, 62 are simple upright open ended standpipes located within the lower partition space 39", the space thus forming a windbox. The standpipes are connected by their lower ends 64 at a vertical level l_1 to openings 48 in the partition walls 34, 36. The upper free ends 66 of the conduits reach upward within the pertition space 39 to a vertical level l_2. The difference Δl in height between levels l_1 and l_2 provides the solid flow seal preventing solid flow upward in the conduits 60, 62 and into the partition space 39".

[0038] Air is supplied from the free ges space or windbox 39" through conduits 60, 62, e.g. as secondary air into the furnece sections 14 and 16. The eir flows from the windbox 39" into the stendpipes 60 and 62 at their upper open ends 66 and further downward through the standpipes, via a bend 63 at the lower end of the standpipes and through openings 48 into the furnece. The lower end of the standpipes is bent for better enebling a fixing of the standpipes to the openings 48 in the generally vertical walls 34, 36.

[0039] FIG. 5 shows more clearly an exemplery position of stendpipe 60, connected to opening 48 in partition wall 34. The lower end 64 of the standpipe is disposed elmost horizontally, upwardly inclined in an angle $\alpha \geq 30°$ but $< 90°$ to the horizontal plene, in order for the stendpipe to be eble to stand out from the wall. The upper bir main part 66 of the standpipe is almost vertical, inclined in an angle $\beta > 45°$ to the horizontal plane.

[0040] Typically all secondary air or gas conduits are arranged to introduce air or gas at a certain predetermined level. There may, however, be conduits at different levels, es well. Thus conduits 60' and 62' (in FIG. 4) may be used to introduce tertiary air at a higher level than conduits 60 and 62. The tertiary air conduits 60' and 62' are as shown in FIG. 4 located in the separate upper portion 39' of the free gas space 39. The horizontal partition 54 dividing the free gas space into separate lower and upper gas spaces enables separate control of e.g. secondary and tertiary air injection. Vertical par-

tition walls may also be used (not shown in the drawings) to divide the free gas space further and to enable separate control of gas injected to the separate furnace sections 14 and 16.

[0041] There may also be conduits connected to openings in the external side walls 22 and 24. Such a conduit 68 is depicted in FIG. 4. The conduit is located in a windbox 70 connected to the external side wall 22.

[0042] While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the scope of the appended claims.

Claims

1. A fluidized bed reactor comprising in its lower part

   - a furnace (12), delimited by side walls (22, 24), and a bottom grid (28), said furnace further having a bed of fluidized solid particles therein,
   - a partition (18) extending within the furnace from the grid upward, said partition being formed as a double wall construction of two upright or inclined partition walls (34, 36), and
   - supplying means, for introducing a gas, such as partial combustion air, into the furnace at a level above the bottom grid, said supplying means including

     - a gas source chamber (38"), such as a windbox, disposed at least partly within said partition,
     - at least one opening (48) in at least one of said partition walls (34, 36) at a level above the bottom grid, and
     - at least one conduit (42, 44) having a first end (46) connected to said at least one opening at a first vertical level l_1 and a second end (50) connected to said gas source chamber (38"), at a vertical l_2 for introducing gas from said gas source chamber to said furnace,

   characterized by

   said at least one conduit (42, 44) having an upward bent portion between its first end (46) and its second end (50), the highest point of said upward bent portion being at a second vertical level l_2, which second vertical level l_2 is higher than the first vertical level l_1 and said level l_3, for forming a solid flow seal, preventing solid particles from flowing backward from said furnace into said at least one conduit in a manner preventing or noticeably decreasing said introduction of gas from said gas source chamber to said furnace.

2. A fluidized bed reactor according to claim 1, wherein the supplying means include

   - a plurality of openings at the same vertical level in at least one of the partition walls, and
   - one of said at least one conduits being connected to each of said openings.

3. A fluidized bed reactor according to claim 1, wherein said second end (50) is connected at said vertical level l_2 to an opening (52) in an enclosure delimiting said gas source chamber (38").

4. A fluidized bed reactor according to claim 3, wherein the gas source chamber (38") is at least partly above the bottom grid (28', 28") and the first vertical level l_1 is above said vertical level l_3.

5. A fluidized bed reactor according to claim 1, wherein a part of the partition space (39, 39') formed between the two partition walls forms the gas source chamber.

6. A fluidized bed reactor according to claim 1, wherein a part of the partition space formed between the two partition walls (34, 36) is delimited at its bottom by a nozzle supporting plate (41) separating said part of the partition space from the gas source chamber (38"), and

   - the conduits (42, 44) arranged within the partition space are connected by their second ends (50) to openings (52) in the nozzle supporting plate (41), for providing gas from the gas source chamber (38") to the furnace.

7. A fluidized bed reactor according to claim 1, wherein the partition (18) is made of cooling surfaces.

8. A fluidized bed boiler according to claim 1, wherein

   - the free gas space is divided by a horizontal partition (54) into an upper and a lower free gas space;
   - the secondary air conduits (60, 62) in said lower free gas space are connected to a row of openings at a first level in the walls of the partition, and additionally
   - tertiary air conduits (60', 62') are provided in said upper free gas space and connected to a row of openings at a second level in the partition.

Patentansprüche

1. Wirbelschichtreaktor, der in seinem unteren Teil umfasst,

   - eine Brennkammer (12), durch Seitenwände (22, 24) und einen Bodenrost (28) abgegrenzt, welche Brennkammer ein Bett aus fluidisierten Feststoffpartikeln darin aufweist,
   - einen Trennkörper (18), der sich innerhalb der Brennkammer vom Rost aufwärts erstreckt, welcher Trennkörper als zweiwandige Konstruktion aus zwei aufrechten oder geneigten Trennwänden ausgebildet ist, (34, 36), und
   - Zuführungsmitteln zur Einführung eines Gases, wie etwa von partieller Verbrennungsluft, in die Brennkammer auf einem Niveau oberhalb des Bodenrostes, besagte Zuführungsmittel bestehend aus
   - einer Gasquellenkammer (38"), wie etwa einem Windkasten, der zumindest teilweise innerhalb des Trennkörpers angeordnet ist,
   - zumindest einer Öffnung (48) in zumindest einer der Trennwände (34, 36) auf einem Niveau oberhalb des Bodenrostes, und
   - zumindest einem Stutzen (42, 44), der ein erstes Ende (46), das mit der zumindest einen Öffnung auf einem ersten Vertikalniveau l_1 verbunden ist, und ein zweites Ende (50) hat, das mit der Gasquellenkammer (38") auf einem Vertikalniveau l_3 verbunden ist zur Einführung von Gas aus der Gasquellenkammer in die Brennkammer,

   dadurch gekennzeichnet, dass
   der zumindest eine Stutzen (42, 44) einen aufwärts gebogenen Abschnitt zwischen seinem ersten Ende (46) und seinem zweiten Ende (50) hat, wobei sich die höchste Stelle des aufwärts gebogenen Teils auf einem zweiten Vertikalniveau l_2 befindet, welches zweite Vertikalniveau l_2 höher als das erste Vertikalniveau l_1 und das Niveau l_3 ist, um eine Feststoffschleuse zu bilden, die verhindert, dass Feststoffpartikel aus der Brennkammer in den zumindest einen Stutzen auf solche Weise zurückfließen, dass die Einführung von Gas aus der Gasquellenkammer in die Brennkammer verhindert oder bemerkenswert verringert wird.

2. Wirbelschichtreaktor nach Anspruch 1, **dadurch gekennzeichnet, dass** die Zuführungsmittel umfassen,

   - eine Vielzahl von Öffnungen auf dem gleichen Vertikalniveau in zumindest einer der Trennwände, und
   - einer aus den zumindest einem Stutzen mit jeder der Öffnungen verbunden ist.

3. Wirbelschichtreaktor nach Anspruch 1, **dadurch gekennzeichnet, dass** das zweite Ende (50) auf dem Vertikaniveau l_3 mit einer Öffnung (52) in einem geschlossenen Raum verbunden ist, der die Gasquellenkammer (38") abgrenzt.

4. Wirbelschichtreaktor nach Anspruch 3, **dadurch gekennzeichnet, dass** die Gasquellenkammer (38") sich zumindest teilweise oberhalb des Bodenrosts (28', 28") und das erste Vertikalniveau l_1 sich oberhalb des Vertikalniveaus l_3 befindet.

5. Wirbelschichtreaktor nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Teil des zwischen den zwei Trennwänden gebildeten Trennraums (39, 39') die Gasquellenkammer bildet.

6. Wirbelschichtreaktor nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Teil des zwischen den zwei Trennwänden gebildeten (34, 36) Trennraums an seinem unteren Teil durch eine Düsen-Stützplatte (41) abgegrenzt ist, die besagten Teil des Trennraums von der Gasquellenkammer (38") trennt, und

   - die im Trennraum angeordneten Stutzen (42, 44) an ihren zweiten Enden (50) mit Öffnungen (52) in der Düsen-Stützplatte (41) verbunden sind, um die Brennkammer mit Gas aus der Gesquellenkammer (38") zu versorgen.

7. Wirbelschichtreaktor nach Anspruch 1, **dadurch gekennzeichnet, dass** der Trennkörper (18) aus Kühlflächen besteht.

8. Wirbelschichtkessel nach Anspruch 1, **dadurch gekennzeichnet, dass**

   - der freie Gasraum durch eine horizontale Trennwand (54) in einen oberen und einen unteren freien Gasraum unterteilt ist;
   - die Sekundärluftstutzen (60, 62) im unteren freien Gasraum mit einer Reihe von Öffnungen auf einem ersten Niveau in den Wänden des Trennkörpers verbunden sind, und zusätzlich
   - Tertiärluftstutzen (60', 62") im oberen freien Gesraum vorgesehen und mit einer Reihe von Öffnungen auf einem zweiten Niveau im Trennkörper verbunden sind.

Revendications

1. Réacteur à lit fluidisé comprenant, dans sa partie inférieure :

   - un foyer (12), délimité par des parois latérales (22, 24), et une grille de fond (28), ledit foyer ayant, en outre, à l'intérieur, un lit de particules

solides fluidisées,

- une cloison (18) s'étendant dans le foyer, vers le haut depuis la grille, ladite cloison étant formée par une construction à doubles parois de deux parois de cloison droites ou inclinées (34, 36), et
- des moyens d'alimentation pour introduire un gaz, tel que de l'air de combustion partielle, dans le foyer à un niveau supérieur à la grille de fond, lesdits moyens d'alimentation incluant :
  - une chambre de source de gaz (38"), telle qu'une boîte à vent, disposée au moins partiellement à l'intérieur de ladite cloison,
  - au moins une ouverture (48) dans au moins une desdites parois de cloison (34, 36) à un niveau supérieur à la grille de fond, et
  - au moins un conduit (42, 44) ayant une première extrémité (46) connectée à ladite au moins une ouverture à un premier niveau vertical l_1 et une deuxième extrémité (50) connectée à ladite chambre de source de gaz (38") à un niveau vertical l_3, pour introduire du gaz de ladite chambre de source de gaz audit foyer,
  - **caractérisé en ce que** ledit au moins un conduit (42, 44) possède une partie courbée vers le haut entre sa première extrémité (46) et sa deuxième extrémité (50), le point le plus élevé de ladite partie courbée vers le haut étant à un deuxième niveau vertical l_2, lequel deuxième niveau vertical l_2 étant plus élevé que le premier niveau vertical l_1 et ledit niveau l_3, afin de former une étanchéité aux écoulements de solides, empêchant les particules solides de s'écouler vers l'arrière, dudit foyer dans ledit au moins un conduit, de manière à empêcher ou à diminuer de façon notable ladite introduction de gaz de ladite chambre de source de gaz audit foyer.

2. Réacteur à lit fluidisé selon la revendication 1, dans lequel les moyens d'alimentation incluent :

   - une pluralité d'ouverture au même niveau vertical dans au moins une des parois de cloison, et
   - un desdits au moins un conduit étant connecté à chacune desdites ouvertures.

3. Réacteur à lit fluidisé selon la revendication 1, dans lequel ladite deuxième extrémité (50) est connectée audit niveau vertical l_3 à une ouverture (52) dans une enceinte délimitant ladite chambre de source de gaz (38").

4. Réacteur à lit fluidisé selon la revendication 3, dans lequel la chambre de source de gaz (38") est située, au moins partiellement, au-dessus de la grille de fond (28', 28") et le premier niveau vertical l_1 est supérieur audit niveau vertical l_3.

5. Réacteur à lit fluidisé selon la revendication 1, dans lequel une partie de l'espace de cloisonnement (39, 39'), ménagé entre les deux parois de cloison, forme la chambre de source de gaz.

6. Réacteur à lit fluidisé selon la revendication 1, dans lequel une partie de l'espace de cloisonnement, ménagé entre les deux parois de cloison (34, 36), est délimitée à sa partie la plus inférieure par une plaque de support de buse (41) séparant ladite partie de l'espace de cloisonnement de la chambre de source de gaz (38"), et

   - les conduits (42, 44), disposés dans l'espace de cloisonnement, sont connectés par leurs deuxièmes extrémités (50) à des ouvertures (52) dans la plaque de support de buse (41), pour délivrer du gaz de la chambre de source de gaz (38") au foyer.

7. Réacteur à lit fluidisé selon la revendication 1, dans lequel la cloison (18) est faite de surfaces de refroidissement.

8. Chaudière à lit fluidisé selon la revendication 1, dans laquelle :

   - l'espace de gaz libre est divisé par une cloison horizontale (54) en des espaces de gaz libres supérieur et inférieur ;
   - les conduits d'air secondaires (60, 62), dans ledit espace de gaz libre inférieur, sont connectés à une rangée d'ouvertures à un premier niveau dans les parois de la cloison et de plus
   - des conduits d'air tertiaires (60', 62') sont prévus dans ledit espace de gaz libre supérieur et sont connectés à une rangée d'ouvertures à un deuxième niveau dans la cloison.

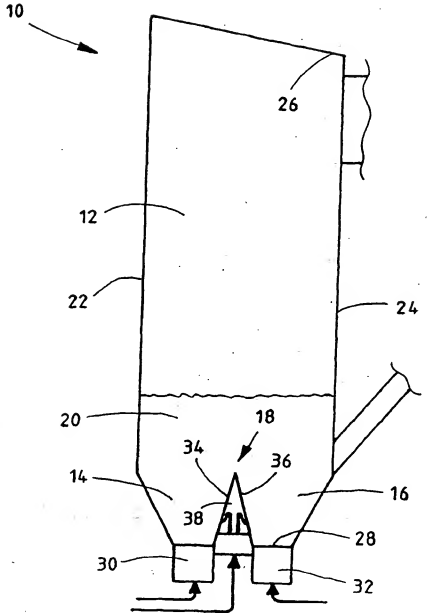

FIG. 1

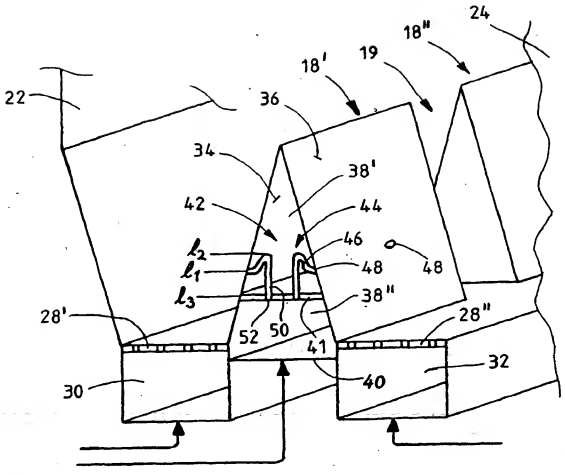
22
36
34
42
18'
19
18"
24
38'
44
46
48
48
l_2
l_1
l_3
38"
28'
28"
52
50
41
40
30
32

FIG. 2

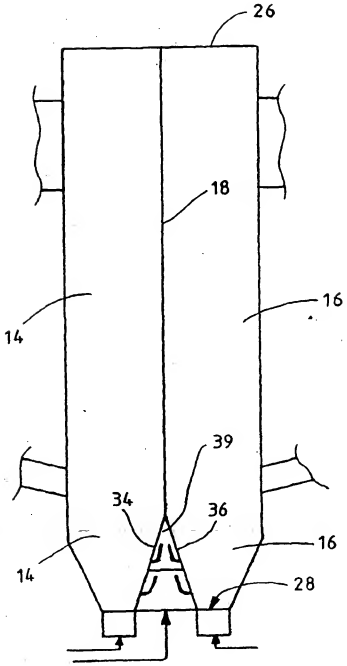

FIG. 3

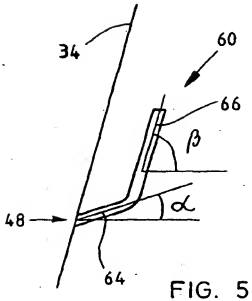
34
60
66
β
48
α
64

FIG. 5

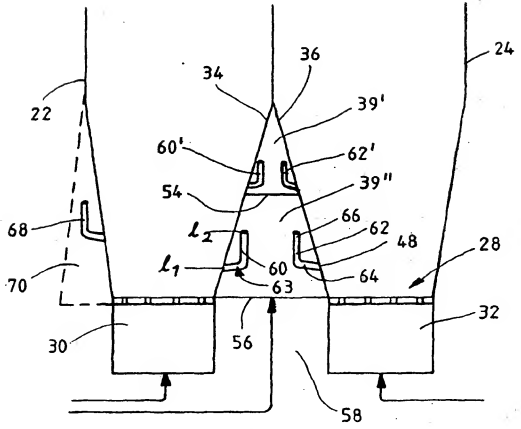
22
34
36
24
39'
60'
62'
39"
54
66
62
48
28
68
l_2
l_1
60
64
63
70
30
56
32
58

FIG. 4